

TITLE OF THE INVENTION

ELECTRONIC APPARATUS, NETWORK SYSTEM, RELAY APPARATUS,
AND STATUS CONTROL METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2002-188444, filed June 27, 2002, the entire contents of which are incorporated herein by reference.

10 BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a relay apparatus that receives and records, for example, television broadcasting and distributes this image data to electronic apparatus via a network, the electronic apparatus that receives the image data distributed by the relay apparatus, a network system composed of the relay apparatus and electronic apparatus, and a status control method, and in particular, to a relay apparatus, electronic apparatus, a network system, and a status control method wherein it is possible to, for example, allow the electronic apparatus to instruct, via the network, an AV function section of the relay apparatus to shift to or recover from its standby status.

2. Description of the Related Art

In recent years, moving-picture compression

techniques and information communication techniques have been markedly improved. Further, the union of AV apparatus and network apparatus has been sped up.

5 Specifically, a single apparatus called a "home gateway" or the like is used to implement, for example, an AV function for recording and reproduction and a network function for playing the roles of a router and an access point.

The home gateway allows video data to be
10 distributed using a domestic network instead of conventional analog video cable. Accordingly, for example, a user in a study located away from a living room where the home gateway is installed can view video data from the home gateway using a notebook personal computer carried in the study.

Further, electronic apparatus such as this home gateway is provided with a standby mode in which power supply to the sections other than those which must be always operated, e.g., an AV function section is
20 interrupted, in order to reduce power consumption during standby.

Shift to or recovery from the standby mode may be automatically executed by the home gateway under predetermined conditions or by the user on the basis of
25 an explicit instruction given by, for example, operating a remote controller.

Here, it is assumed that after finishing viewing

video data from the home gateway installed in the living room, using the notebook personal computer carried in the study, the user shifts the home gateway to the standby mode.

5 The remote controller irradiates a light receiving section of the home gateway with a very directional infrared ray to transmit a command signal. Thus, it cannot be utilized to transmit command signals between two places partitioned by a wall or the like. That is,
10 after all, the user must go to the living room in order to shift or recover the home gateway to or from the standby mode.

Further, the user does not know the current status of the home gateway installed in the living room if,
15 for example, he or she has been in the study from the outset.

BRIEF SUMMARY OF THE INVENTION

An embodiment of the present invention may provide a electronic apparatus which can communicate with
20 a different electronic apparatus, the electronic apparatus comprising: an inquiring unit configured to inquire the different electronic apparatus about an operational status of the different electronic apparatus; a receiving unit configured to receive the operational status of the different electronic apparatus from the different electronic apparatus; and
25 a display unit which can display the operational status

of the different electronic apparatus received via the receiving unit.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The features and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention, and together with the general description given above and the detailed description of the embodiments given below, serve to explain the principles of the invention.

FIG. 1 is a diagram showing an example of a domestic network system according to an embodiment of the present invention;

FIG. 2 is a diagram showing a configuration of a home server according to this embodiment;

FIG. 3 is a diagram showing a stack configuration of a network processor in the home server according to this embodiment;

FIG. 4 is a view illustrating a control panel displayed on a screen of a personal computer in order

to operate an AV function section of the home server according to this embodiment; and

FIGS. 5A and 5B are timing charts showing the flow of operations of the domestic network system according to this embodiment.

DETAILED DESCRIPTION OF THE INVENTION

The embodiments of the present invention will be described below with reference to the drawings.

FIG. 1 is a diagram showing an example of a domestic network system according to this embodiment of the present invention.

This domestic network is a wireless LAN in which a home server 10 placed in a living room 1 transmits and receives data to and from a personal computer 20 in a study 3 separated from the living room 1 by a wall 2, on the basis of a wireless communication protocol such as IEEE 802.11b, as shown in FIG. 1.

The home server 10 is a so-called home gateway. It is provided with a function of, for example, loading video data dispatched to a broadband network 11 to store the data, receiving video data dispatched over electromagnetic waves, through a broadcasting antenna 12 to store the data, outputting the stored video data to a television apparatus 13, or distributing the data to the personal computer 20 via a wireless LAN.

Thus, a user can use the television apparatus 13 to view video data while in the living room. On the

other hand, while in the study, the user can use the personal computer 20 to view video data.

FIG. 2 is a diagram showing a configuration of the home server 10.

5 An AV function section 14 is a mechanism that processes reception, storage, and distribution of video data, i.e., main service provided to the user by the home server 10. The AV function section 14 is provided with a standby mode serving to reduce power consumption
10 during standby. Further, to provide this service, the AV function section 14 has a video input section 141 to which video data is input, an NTSC decoder 142 that decodes the input video data into NTSC format, an MPEG2 encoder/decoder 143 that compresses the decoded video
15 data into MPEG2 format or expands the compressed video data, a CPU 144 that controls the entire AV function section 14, a bridge circuit 145 that bridges between a processor bus and a PCI bus, an SDRAM 146 connected to the bridge circuit 145 and acting as a main memory to store programs and data used by the CPP 144, a bridge circuit 147 that bridges between the PCI bus and an ISA bus, an HDD 148 connected to the bridge circuit 147 and acting as an external storage to store a large amount
20 of programs and data loaded into the SDRAM 146 or swapped by the SDRAM 146, and a ROM 149 that stores
25 a boot loader.

Further, an embedded controller 15 instructs

the AV function section 14 to shift to and recover from the standby mode. Concurrently with the shift to and recovery from the standby mode, the embedded controller 15 provides such control as supplies power from a power supply 16 to the AV function section 14 or interrupts this power supply.

A network processor 17 plays the role of a receptionist to allow the personal computer 20 to cause, via a network, the AV function section 14 to shift to and recover from the standby mode; this operation is characteristic of the present invention. The network processor 17 has an Ethernet section 171, a wireless LAN section 172, a flash ROM 173, and an SDRAM 174.

The Ethernet section 171 is a circuit that controls data transfers in lower layers of an OSI. Further, concurrently with such an operation of the Ethernet section 171, the wireless LAN section 172 controls data transfers in the lower layers of the OSI in conformity with a wireless communication protocol such as IEEE 802.11. Further, the flash ROM 173 stores a program describing a procedure of operating the network processor 17, various parameters, and the like. The SDRAM 174 stores a protocol stack that executes a predetermined data transfer procedure using the Ethernet section 171 or the wireless LAN section 172.

The following two signal lines are arranged

between the network processor 17 and embedded controller 15 configured as described above: an up/down signal line used to allow the network processor 17 to instruct the embedded controller 15 to shift to or 5 recover from the standby mode and a status signal line used to allow the embedded controller 15 to indicate the status of the AV function section 14 to the network processor 17. An up/down signal transmitted via the up/down signal line is a toggle signal. The AV 10 function section 14 is controlled to toggle its status at each rising edge of the up/down signal.

Upon receiving a command allowing the personal computer 20 to cause, via the network, the AV function section 14 to shift to the standby mode, the network processor 17 references a status signal outputted by 15 the embedded controller 15 to check the current status of the AV function section 14. If the mode is not standby, the network processor 17 changes the up/down signal to a high level and then to a low level to generate a rising edge to instruct the AV function 20 section 14 to shift to the standby mode. Similarly, upon receiving a command causing the AV function section 14 to recover from the standby mode, the network processor 17 checks the current status of the 25 AV function section 14. If the mode is standby, the network processor 17 uses the up/down signal to instruct the AV function section 14 to recover from

the standby mode.

On the other hand, upon receiving a rising edge of the up/down signal, the embedded controller 15 dispatches a so-called INT signal to instruct the CPU 144 to get ready to shift to the standby mode. Upon receiving an acknowledge signal indicating that the CPU 144 is now ready, the embedded controller 15 controls the power supply 16 to interrupt power supply to the AV function section 14. On the other hand, to recover from the standby mode, the embedded controller 15 controls the power supply 16 to resume power supply to the AV function section 14.

FIG. 3 is a diagram showing a stack configuration of the network processor 17.

A command transmitted by the personal computer 20 via the network to shift, for example, the AV function section 14 to the standby mode is passed to a standby control section 24 via a wireless LAN MAC 21, a MAC bridge 22, and an IP router 23 as a power supply control packet. Upon receiving this power supply control packet, the standby control section 24 uses the status signal dispatched by the embedded controller 15 to check the status of the AV function section 14. The standby control section 24 then gives an instruction to the embedded controller 15 to shift the AV function section 14 to the standby mode. Then, the standby control section 24 transmits a notification to the

personal computer 20 as a power supply status packet,
the notification indicating that the AV function
section 14 has shifted to the standby mode. This power
supply status packet is passed to the personal computer
5 20 via the IP router 23, the MAC bridge 22, and the
wireless LAN MAC 21.

FIG. 4 shows a control panel displayed on a screen
of the personal computer 20 in order to operate the AV
function section 14 of the home server 10. When a
10 pointing device such as a mouse is used to depress a
power supply status control button X on the control
panel, a command is transmitted to the home server 10,
the command causing the AV function section 14 to shift
to or recover from the standby mode. Further, the
15 power supply status control button X changes its color
on the basis of the contents of the power supply status
packet from the home server. That is, it is red when
the AV function section 14 is in the standby mode. It
is otherwise green, i.e., when the AV function section
20 14 is performing normal operations. Thus, the user of
the personal computer 20 is notified of the current
status of AV function section 14 of the home server 10.

Now, with reference to FIGS. 5A and 5B,
description will be given of flow of operations of this
25 domestic network system.

During the start-up of operation software for the
home server 10 including the display of screen of the

control panel, the personal computer 20 first transmits a status check command to the home server 10 in order to check the current status of the AV function section 14 (S1). Upon receiving this status check command, the 5 network processor 17 checks a status signal output by the embedded controller 15 (S2). In this case, the AV function section 14 is assumed to be in the standby mode.

After confirming that the AV function section 14 10 is in the standby mode, on the basis of this status signal, the network processor 17 returns a status command indicating the standby status (S3). The personal computer 20 determines from the returned 15 status command that the AV function section 14 is in the standby mode and then displays the power supply status control button X on the control panel with red (S4).

The display of the power supply control button X allows the user to determine the status of the AV 20 function section 14. Upon determining that the AV function section 14 is in the standby mode, the user uses the mouse or the like to click the power supply status control button X to recover the AV function 25 section 14 from the standby mode. At this time, the personal computer 20 transmits a power-on command to the home server (S5).

Upon receiving this power-on command, the network

processor 17 confirms that the AV function section 14
is in the standby mode, on the basis of a status signal
outputted by the embedded controller 15. The network
processor 17 then generates a rising edge of the
5 up/down signal to instruct the embedded controller 15
to recover from the standby mode (S6).

Subsequently, the network processor 17 waits for
the status signal output by the embedded controller 15
to indicate a normal operation mode. When the status
10 signal indicates the normal operation mode, the network
processor returns a status command to the personal
computer 20, the command indicating the normal
operation status (S7). Then, the personal computer 20
determines from the returned status command that the AV
15 function section 14 is in the normal operation mode and
then displays the power supply status control button X
on the control panel with green (S8).

In contrast, to shift the AV function section 14
of the home server 10 to the standby mode, the user
20 uses the mouse or the like to click the power supply
status control button X. At this time, the personal
computer 20 transmits a power supply standby command to
the home server 20 (S9).

On the other hand, upon receiving this power
25 supply standby command, the network processor 17
confirms that the AV function section 14 is in the
normal operation mode, on the basis of a status signal

outputted by the embedded controller 15. The network processor 17 then generates a rising edge of the up/down signal to instruct the embedded controller 15 to shift to the standby mode (S10).

5 Subsequently, the network processor 17 waits for the status signal outputted by the embedded controller 15 to indicate the standby mode. When the status signal indicates the standby mode, the network processor 17 returns a status command to the personal computer 20, the command indicating the standby status 10 (S11). Then, the personal computer 20 determines from the returned status command that the AV function section 14 has entered the standby mode and then displays the power supply status control button X on 15 the control panel now with red (S12).

In this manner, in this domestic network system, the network processor 17 has a mechanism that accepts a command according to the network protocol, the command causing the AV function section 14 to shift to or 20 recover from the standby mode. The user can thus operate the AV function section 14 from the personal computer 20. The network processor 17 also has a mechanism that transmits status information indicating the status of the AV function section 14. The user can 25 therefore use the AV function section 14 more conveniently.

Additional advantages and modifications will

readily occur to those skilled in the art. Therefore,
the invention in its broader aspects is not limited to
the specific details and representative embodiments
shown and described herein. Accordingly, various
5 modifications may be made without departing from the
spirit or scope of the general inventive concept as
defined by the appended claims and their equivalents.